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**1 Bottle breaking device**

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**EC:** B02C19/14B

**IPC:** B02C19/14

**Publication info:** EP0495522 - 1992-07-22

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10/539055

JC17 Rec'd PCT/PTO 15 JUN 2005

THE PATENTS ACT 1977, AS AMENDED,  
AND  
THE RULES MADE THEREUNDER

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I, Madgie Vintin BA., MITI., translator to Messrs. Taylor and Meyer of 29 Kingsmead Road, London SW2 3HY, declare that I am conversant with the German and English languages and that to the best of my knowledge and belief the accompanying text is a true translation of the text on which the European Patent Office has granted or intends to grant European Patent No. 0 495 522 in the name of FIRMA ULRICH HEIN.

Signed this      twenty-first                      day of December                      1995

*M. Vintin*  
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The invention relates to a crushing device for containers, such as in particular bottles, made of materials including and in particular glass, having a housing, an insertion opening in the housing for the containers which are to be crushed, at least one stop inside the housing for holding the container to be crushed in position for crushing, and at least one motor-drivable tool rotatably disposed in the housing for crushing the container.

Such a crushing device for plastic containers is known from US-A-4,871,118.

In bottling plants such as breweries, wine-cellars, sparkling wine producers, manufacturers of soft drinks, fruit juices, mineral water and the like, there are frequently bottles which have been rejected, e.g. because of damage, and have to be crushed. Crushing was generally effected by throwing such bottles by hand into specially provided containers but said type of disposal involved considerable drawbacks since shattering the glass bottles in said manner was extremely noisy and also a potential cause of accidents because of the glass splinters produced.

From DE-A-39 02 487 a crushing device for glass bottles in particular is known, which comprises a housing, one or more feed shafts projecting into the housing for the bottles to be crushed and a motor-driven tool holder rotatably supported in the housing and having radially extending tools in the form of rods, which in the course of rotation engage into the interior of the feed shafts and thereby shatter the bottles.

Proceeding from said prior art, the object of the invention is further to optimize the crushing device known from DE-A-39 02 487. On the one hand, the construction of the crushing device is to be simplified and, on the other hand, its mechanical stability is to be increased. Finally, its performance is also to be further improved.

The solution according to the invention is substantially that a grate forming the at least one stop is disposed inside the housing, the grate as a whole being of an angular construction and comprising a first grate portion, which slopes obliquely downwards from the insertion opening, and a second grate portion which adjoins the first grate portion (42) at an angle preferably of around  $90^\circ$  and extends obliquely upwards. A third grate portion may further be provided, which adjoins the second grate portion and extends to the side wall of the housing lying opposite to the insertion opening. The grate is connected to at least two opposing side walls of the housing, preferably to all four side walls, and in addition the grate bars may be provided with bottom support legs as an assembly aid.

Since, as in prior art, a plurality of tools will generally be provided alongside one another in order to crush a plurality of adjacent bottles simultaneously, it is possible, because of the grating structure according to the invention, to avoid the comparatively complicated solution provided in prior art, which involves a plurality of adjacent feed shafts projecting into the housing. The bottles may be crushed both when lying parallel and also when lying at right angles to the grate bars.

As the tools rotate, they at least partially penetrate the grate so that the material is necessarily pressed through the grate, thereby achieving good crushing results with a consequently high packing density of the crushed material. It is particularly preferred if there is a gap of less than 10 mm on either side between tool and adjacent grate bars, said gap preferably being between 3 and 5 mm.

The expenditure of force required to crush the bottles, and hence the required motor output of the crushing device, is particularly low if the tools extending radially from the tool axis of rotation are constructed in such a way that they act

first upon the body of the bottles held in stop position; to said end, in a preferred development of the invention, the tool at its - viewed in the direction of rotation - front side is curved in such a way that with increasing rotation the working point travels radially outwards. Starting the crushing operation at the body of the bottle requires a comparatively low expenditure of energy and equally, because of the initially short radial distance of the working point from the axis of rotation, at a specific torque high crushing forces are available.

Further advantageous features of the invention are indicated in the sub-claims as well as in the following detailed description of a preferred embodiment with reference to the drawings. The drawings show:

Fig.1            a vertical section through a crushing device according to the invention, at right angles to the tool axis, and

Fig.2            a vertical section through the crushing device according to Fig.1, at right angles to the drawing plane of Fig.1.

The crushing device illustrated in Figs.1 and 2 comprises a housing 2, which comprises four side walls 4, 6, 8 and 10 and a removable cover 12. Formed in the side walls 8, 10 are openings 14, 16, through which extends a shaft 18, which is rotatably supported by means of ball bearings 20, 22 held on the side walls 8, 10 and is drivable by means of a motor (not shown in detail). Welded on the shaft 18 are four double tools 24 to 30, which are constructed in an axially symmetrical manner relative to the axis 32 of the shaft 18 and are each moreover identical in construction and offset relative to one another only in a radial direction such as to form with one another an angle of  $45^\circ \cdot N$ , where N is an even number between 1 and 3. In Fig.1, only the double tool 28 is

shown, the double tools 26 and 24 being merely indicated by dashes.

Formed in the side wall 4 of the housing 2 is an insertion opening 34, through which extends the end of a feed shaft 36, by means of which the containers to be crushed are fed into the interior of the crushing device.

Provided approximately in the bottom third of the housing 2 is a grate denoted as a whole by the reference numeral 38 which, in the case of the present embodiment, comprises five parallel sectional grate bars 40 extending at right angles to the axis 32. The sectional grate bars 40 define a first grate portion 42, which slopes obliquely downwards from the insertion opening 34 at the same gradient as the feed shaft 36, as well as an adjoining second grate portion 44, which extends at right angles obliquely upwards from the first grate portion 42. Adjoining said second grate portion is a third grate portion 46, which extends horizontally and ends at the side wall 6 of the housing 2, to which it is welded. The end of the grate portion 42 facing the side wall 4 is likewise welded to said side wall 4. In addition, there are formed as assembly aids on the grate 38, in the region of the side wall 4 and approximately centrally in the transition area between grate portion 42 and grate portion 44, legs 48 and 50 which terminate in the bottom plane of the housing 2 defined by the bottom edges of the side walls 4 to 10. As the drawings reveal, the housing is otherwise open in a downward direction so that crushed bottle material may drop down into a collecting container or the like.

The bottles or the like fed through the feed shaft 36 of the crushing device slide down along the first grate portion 42 until they strike against the second grate portion 44. A bottle 52 is illustrated by dashes in said position. It goes without saying that the insertion opening 34 and the feed shaft 36 are, say, as wide as the side wall 4 of the housing 2

so that a plurality of adjacent bottles may pass into the interior of the housing 2 and come to lie on the grate portion 42; in the case of the embodiment, there is room for four bottles adjacent to one another, in accordance with the four longitudinal grooves of the grate and the four axially offset double tools 24 to 30.

As is outlined in Fig.1, however, the bottles 52 need not necessarily be aligned parallel to the grate bars and the plane of motion of the tools; they may also come to lie at right angles thereto in the manner indicated by the reference numeral 52'. In said case also, the bottles are properly crushed. Even when the bottles are positioned untidily or haphazardly, crushing is guaranteed.

It is clearly evident from Fig.1 that the leading edge 54 of the tool 28' of the double tool 28 - like the leading edges of all of the other tools - is curved in such a way that it comes into engagement with the bottle 52 at a point P lying in the region of the body of the bottle. When force is applied in the region of the body of the bottle, the bottle 52 may be shattered particularly easily. Upon further rotation of the tool 28' in direction of rotation A, the bottle 52 is crushed increasingly towards the neck of the bottle, the working point of the tool progressively shifting radially outwards, and finally the shattered refuse glass material is pressed down by the tool 28' through between the grate bars while being subjected to further crushing. The lateral distance of the tools from the grate bars in the case of the described embodiment is 4 mm.

At this point, it should be observed that it goes without saying that the size of the crushing device and the shaping of the grate, tools and the like are adaptable and should be adapted to the specific shape of bottles to be crushed since, as a rule, a bottling plant always uses only one type of bottle.

The crushing device for containers according to the invention may be used not only for glass bottles but also for other containers, such as plastic containers or in particular also for tin cans. If necessary, an easy exchange of the tools is possible in that, after removal of the housing cover 12, the shaft together with the tools may be lifted out by means of suitable upwardly extending recesses in the side walls 8, 10 and replaced by a shaft having different tools.



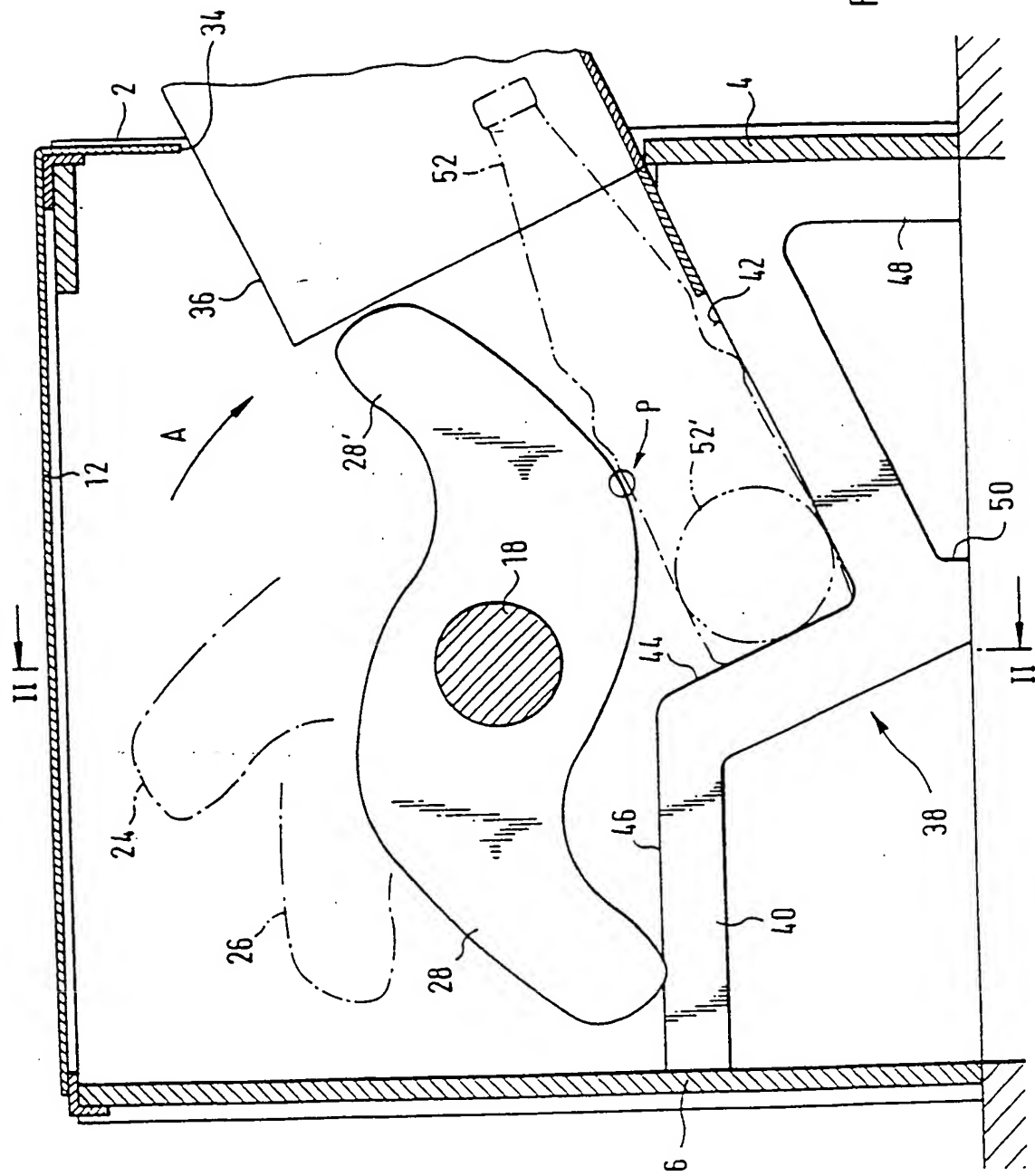
Claims

1. Crushing device for containers (52), such as in particular bottles, made of materials including and in particular glass, having a housing (2), an insertion opening (34) in the housing (2) for the containers (52) which are to be crushed, at least one stop inside the housing (2) for holding the container (52) to be crushed in position for crushing, and at least one motor-drivable tool (24 - 30) rotatably disposed in the housing (2) for crushing the container (52), a grate (38) which forms the at least one stop being disposed inside the housing (2), characterized in that the grate (38) as a whole is of an angular construction and comprises a first grate portion (42), which slopes obliquely downwards from the insertion opening (34) in such a way that the containers introduced through the insertion opening slide downwards over said grate portion, and a second grate portion (44) which adjoins the first grate portion (42) in an obliquely upward extending manner to form the stop.
2. Crushing device according to claim 1, characterized in that the second grate portion (44) with the first grate portion (42) forms an angle of around 90°.
3. Crushing device according to claim 1 or 2, characterized in that the axis of rotation (32) of the tool (24 to 30) is disposed substantially above the grate (38).
4. Crushing device according to one of the preceding claims, characterized in that the grate (38) is connected to at least two opposing side walls (4, 6) of the housing (2).
5. Crushing device according to one of claims 2 to 4, characterized in that adjoining the second grate portion (44) is a third grate portion (46) which extends to the

side wall (6) of the housing (2) lying opposite to the insertion opening (34).

6. Crushing device according to one of the preceding claims, characterized in that the grate bars (40) are provided with additional bottom legs (48, 50).
7. Crushing device according to one of the preceding claims, characterized in that the at least one tool (24 to 30) upon its rotation at least partially penetrates the grate (38).
8. Crushing device according to one of the preceding claims, characterized in that the tool (24 to 30) at its - viewed in the direction of rotation (A) - front side (54) is curved in such a way that with increasing rotation the working point (P) travels progressively radially outwards.
9. Crushing device according to one of the preceding claims, characterized in that a plurality of tools (24 to 30) are disposed on a common axis of rotation (32).
10. Crushing device according to one of the preceding claims, characterized in that each tool takes the form of a double tool (24 to 30) in that it extends as a single piece in radially opposite directions.
11. Crushing device according to claims 9 and 10, characterized in that four double tools (24 to 30) are fastened to a common shaft (18).
12. Crushing device according to one of the preceding claims, characterized in that the gap width provided on either side between the tool (24 to 30) and adjacent grate bars (40) is less than 10 mm, being preferably between 3 and 5 mm.

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Fig. 2

